DOCUMENT RESUME

ED 241 463 SP 023 686

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TITLE Nutrition and Learning: The Breakfast Role.
PUB DATE 2 Feb 84
NOTE 37p.; Paper presented at the Annual Meeting of the American Association of Colleges for Teacher Education (36th, San Antonio, TX, February 1-4, 1984).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Achievement; Attitude Change; *Breakfast Programs; Dietetics; *Eating Habits; Elementary Education; *Elementary School Students; *Nutrition Instruction; *Reading Improvement; Student Attitudes

ABSTRACT

A pilot study examined the effects of improved breakfast nutrition on students' academic achievement. Participants were 142 intermediate school children who usually ate breakfast in school. All children were given the Gates-MacGinitie Reading Tests, Form 1, Levels A-D, and were ranked according to their total reading scores. The experimental and control groups were matched by reading level and grade. The experimental group had a different menu each day providing variety, high density carbohydrates, and protein. The control group received a standard breakfast of fruit or juice, milk, and a packaged cereal. At the conclusion of the experimental period all children were tested on an alternate form of the Gates-McGinitie Tests and results were compared. During the second semester of school the two groups switched roles. A trend was observed that indicated the experimental breakfasts may be associated with greater gain in reading scores. Further research is underway. Detailed descriptions of the menus and notes on the children's reactions to them are appended. (JD)

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ED241463

NUTRITION AND LEARNING: THE BREAKFAST ROLE

A Research Study

conducted at the

College Learning Laboratory

State University College at Buffalo

U.S. DEPARTMENT OF EDUCATION
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"Children, breakfast is ready. If you don't hurry, you'll miss the school bus."

"Oh Mom, I can't miss the bus. Besides, I'm not hungry in the morning. I'll eat all my lunch. Bye, see you later."

That's one early morning scenario. Let's look at some others.

"Come on, Mom. You know I hate that cereal. I don't care if it is the breakfast of champions. I like the pink and blue kinds with lots of sugar. They taste better."

Or

"But you know I'm allergic to milk in the morning."

Or

"Listen, kids, eat up. This one bowl of cereal gives you your entire day's requirements of vitamins and minerals."

"So what! I don't have time and I hate it. I'd have some chocolate milk if you'd buy it."

The importance of breakfast in getting a good start each day has been widely promoted by mothers and advertising agencies. To these advocates can be added a growing number of nutritionists and educators who share the belief that the quality and quantity of food children consume can affect more than physical growth. There is a growing body of evidence to indicate that mental ability, learning, and behaviors are affected by nutrition.

There is also widespread recognition that many children, for

a variety of reasons, have inadequate or unsuitable diets. It is not surprising, therefore, that schools have added nutrition to the responsibilities of public education. In many areas, free and reduced-cost school lunches and breakfasts are provided to promote physical and intellectual growth.

Several early studies indicated breakfast and mid-morning snack programs resulted in improved learning and physical performance, as well as better attitude and concentration. However, in other studies there were no effects found that could be clearly related to breakfast. What did appear clear was that further study was needed to explore the effect of breakfast programs on school achievement, particularly for children from low-income families, who otherwise might start the day with little or inadequate nutrition.

With this in mind, a pilot study was designed to examine the effects of improved breakfast nutrition on academic achievement. At the College Learning Laboratory of the State University College at Buffalo, 87% of the school population were receiving free or reduced-cost lunch, but only 20% to 25% received breakfast. It appeared to be a promising direction for study since too many children in the school appeared tired and lethargic in the morning, the time when the major portion of the academic instructional program is presented.

The College Learning Laboratory, a demonstration school located on the campus of the college, provides an ideal setting for such a research study. It has a student body of about 900, ranging from nursery through eighth grade. The school is racially integrated, with 50% of the children from minority groups, mainly black, but including some Native American Indians, Asians, and Hispanics. The overwhelming majority live within the city of Buffalo. General

economic status is indicated by the fact that 87% of the children are eligible for free or reduced-cost meals.

The mission of the school is threefold: 1) to provide for the intellectual, social and physical development of children; 2) to provide the college with a setting for learning and practice situations for college students; and 3) to provide for educational research. As part of the second mission, six college students in the Nutrition and Food Science program were involved in planning and implementing the experimental breakfasts.

In September 1982, 142 Intermediate School children who usually ate breakfast in school volunteered to participate in an experimental breakfast program. The third, fourth, and fifth graders were told that they would be placed in one of two groups and would eat the breakfast assigned to their group. All the intermediate children were given the Gates-MacGinitie Reading Tests, Form 1, Levels A through D. The children participating in the program were ranked within each of the three grades according to their total reading scores. They were then assigned alternately to the experimental group, the Stars, and the control group, the Hearts. Thus the two groups were matched by reading level and grade. A heart or star emblem was attached to each child's badge, which had to be shown at the food checkout line.

The experimental group, the Stars, had a different menu each day, one which attempted to provide variety, high density carbohydrates, protein, and a change from the heavily sugared cereals that most children seem to prefer. The control group, the Hearts, had the standard breakfast of fruit or fruit juice, milk, and packaged cereal selected from a wide array. One morning a week,

an enriched muffin or donut was substituted for the cereal.

The experimental menus were planned by the School Food Services Manager three days a week and by the six college students from Nutrition and Food Science the other two days. The students prepared and served the food on those days and interviewed the children individually to determine their reactions to the experimental breakfasts. In addition, they prepared outlines of the menus, giving serving size, nutritional value, cost, and children's reactions.

Considerable interest in breakfast was stimulated by the experimental menus. Pancakes with fruit, muffins with applesauce, toast with peanut butter, and open-faced grilled cheese were popular items. They were sufficiently familiar to be enjoyed at breakfast time. Pizza with pepperoni or frankfurter in a bun were characterized by most children as inappropriate for the first meal of the day, but they were eaten with obvious enjoyment.

Not all experimental breakfasts were accepted with enthusiasm. Oatmeal, even when garnished with fruit, and scrambled eggs were the least popular breakfasts. In many cases the children could not be coaxed to taste a small sample. Their dislike from previous experiences or from lack of experience were hard to overcome. In other cases, when children could be persuaded to mix raisins in the oatmeal for sweetness, or when sliced frankfurters were served with the eggs, they found the food more acceptable.

Over a period of time, attitudes changed in respect to both appropriateness and appeal. There was excited anticipation each morning and occasionally some grumbling. Children in the control

group were frequently dissatisfied with their packaged cereal breakfasts when their friends were having a hamburger or pancakes with blueberry sauce.

There were some days, usually oatmeal and scrambled egg days, when check-outs for "eating it all up" were below average. Attendance at breakfast ranged from 75% of those participating in the program to a low of 26% one day. Occasional poor attendance could be attributed to late school buses, rejection of the day's menu, or forgetting to check out.

The popularity of the breakfast program can be assessed in several ways. There were only two adverse reactions from parents. One mother complained that her child in the Heart group had cold cereal while the other group had warm breakfasts. Another mother withdrew her child the day after pizza was first served. As for the children, they were very vocal in expressing their disappointment when the pilot program ended on December 15.

At the conclusion of the experimental period, all the Intermediate Team children were tested on an alternate form of the Gates-MacGinitie Reading Tests. Total reading score results were compared using the Extended Scale Scores (ESS).

The gain or loss in ESS scores was computed for all the intermediate pupils. The average gain in ESS was determined for the Stars (experimental group), the Hearts (control group), and those children who did not participate in the school breakfast program. The ESS gain was converted to gain in months. The expected gain for this nine week period would be approximately five ESS units or two months. The data revealed that the experimental

group gained 4.25 months and the control group gained 1.82 months. The experimental group showed more than twice the gain of the control group and twice the expected gain for the average child, apparently substantiating the hypothesis that a more nutritious breakfast has a positive effect on achievement, as measured by reading scores. (See Appendix A)

During second semester, the two groups were switched so that the Hearts, the former control group, was served the experimental breakfasts and the Stars, the former experimental group, became the control. Reading scores at the end of the semester revealed an additional gain of approximately four months for both groups. During the second semester, however, there was an emotional component that may have affected the results. Most of the original experimental group expressed reactions ranging from disappointment to resentment at having to become the control group. Many, in fact, resorted to subterfuge to obtain the experimental breakfasts.

Both the test results and the children's reactions to the experimental breakfast program indicated the need to devise a more carefully designed study that would eliminate any Hawthorne effect, whereby any special treatment might be suspected of motivating children towards greater effort. In addition, better methods were designed to record the amounts of food consumed by each child. Third, the control group was located in another school with a similar pupil population. Fourth, the data obtained each day has been entered into a computer for accuracy and ease of retrieval. Fifth, greater emphasis has been given to nutrition education for the children.

For the second phase of the breakfast study, another school in the Buffalo area that has a similar population was chosen for the control. This school does not have cooking facilities; lunches and breakfasts are prepackaged and delivered each day. As the children arrive in the morning, they report to the lunchroom, pick up their tray, eat breakfast, and then leave for class, making room for the next group. Breakfast consists of juice, cereal and milk, with sweet rolls, enriched donut, or granola bars substituted for cereal once or twice a week. In the control school, forty-eight children were enrolled in the breakfast program. Of that number, thirty-six attend regularly, receiving both free breakfast and lunch.

At the College Learning Laboratory, 127 children enrolled in the breakfast program in September. With the new system of record keeping devised this year, there is much greater accuracy both in number of breakfasts and in amount of food consumed by each child. Each child is given a breakfast consumption form with his meal each morning. Food Systems Management students and faculty members circulate in the cafeteria and fill in the child's identification number and indicate the amount of food consumed: all, 3/4, 1/2, 1/4 or none. Each day the children who attended are checked off on a master list, and the percentage of food they consume each week is tallied.

In addition, each child has a weekly punch card indicating those days he or she attended breakfast. The cards are distributed the first day of the week and are punched each day. It is the child's responsibility to present the card each morning and

to be to be responsible for its safekeeping. A fully punched card can be redeemed at Friday's lunch for a free treat. About 20 to 25% have been redeemed each week. (See Appendix B)

The menus are planned, prepared, and served by the Food Systems Management majors and the school cafeteria manager. Nutrition data and costs are recorded, and the reactions of the children are duly noted. The immediate feedback is particularly valuable to the college students since they need to be aware of their consumers' likes and dislikes. And the children consistently earn A+ for honesty!

Serving a good breakfast in school is only one component in the goal of developing good habits and attitudes about the first meal of the day. Ongoing nutrition education is essential if children are to develop good attitudes based on knowledge. Good food habits developed in childhood are likely to continue into adult life.

Shortly after the special breakfasts started, a thirty-minute film, The Breakfast Connection, was shown on the school's television station to all intermediate classes. Subsequently, two of the college students met with small groups to react to the film, discuss the preparation of traditional and non-traditional breakfast foods, and to learn about their nutritional value. During these meetings children were able to express their mixed feelings about pizza and hamburgers for breakfast. After the initial shock to newcomers to the program, most succumbed to the good taste and fun of a non-conventional breakfast.

In November, one week was devoted to dairy products. During breakfast, a table was set for tastings of yogurt and cottage cheese.

Any student who participated in the special tasting received a large button that stated, "I was a dairy taster today." The popular choice was fruited yogurt.

To make the entire school more conscious of dairy products, charts showing their nutritional value and uses in cooking were displayed in the cafeteria and on a special bulletin board. In addition, the school lunches all had a dairy emphasis.

Another part of dairy week was instruction followed by a coloring contest for kindergarten and primary grades. All who participated were given a treat at the end of the week and had their pictures displayed.

The social aspect of breakfast is another important factor. For the most part, the children eat in the same groups each day. Sometimes they are noisy, their table manners often leave much to be desired, and some of their comments rate high in shock value. However, most of the children are eating, many are asking for seconds, and most are having a good time. That's not a bad way to start the day.

Perhaps the biggest surprise and reward for the semester came in December, when the Food Systems students' semester was coming to an end. To culminate their course, the students planned a special sit-down meal for the 24 children who attended at least 80% of the breakfasts. Tables were set in the faculty lounge with placemats, napkins, fresh juice, and orange baskets filled with fruit. The children were served scrambled eggs, sausage, toast, milk and a pop tart. They were joined by the cafeteria manager, the principal, and several faculty members. The children's be-

havior was exemplary, in contrast with their usual, more casual, sometimes sloppy manners. At the end of the meal, they accepted their special certificates with thanks and with pride. The future hospitality leaders who prepared and served the meal learned more than they had anticipated during this assignment.

Results

A second form of the Gates-MacGinitie Reading Tests was given to all the third, fourth, and fifth graders in the CLL and the control school. Growth in reading ability was obtained by comparing extended scale scores of the pre- and posttests.

"The extended scale scores have been developed so that a student's or a group's progress in reading can be followed over a period of years on a single, continuous scale. . . . Since the ESS units represent equal units of achievement, growth increments at different points on the scale can be compared. Growth in achievement of a student or of a group, can be compared with the growth of other students or groups, even when the level of achievement is not the same to begin with."[1]

Children were included in the breakfast group figures if they had school breakfast at least fifty percent of the time. Average gain in total reading was calculated for the experimental and the control groups, and the ESS scores were converted to gain in months. The experimental group showed an average gain of seven months, while the control group gained 5.25 months. Expected gain for the time period would be four months. (See Appendices C,D)

Independent t-test analysis resulted in a t value of 1.02,

[1] MacGinitie, Walter H. Gates-MacGinitie Reading Tests: Teacher's Manual Level D. Houghton-Mifflin Company, Boston, 1978, pp. 46,7.

which is not significant at the .05 level. However, there is a trend, both in these results and in the pilot study, that indicate that the experimental breakfasts may be associated with greater gain in reading scores.

At this point is it important to indicate that this study was not conducted under clinical conditions. Every effort was made to keep accurate records on attendance and consumption in both schools. However, children in both programs may have some food at home before coming to school. In addition, one can only speculate on what other meals or "junk food" have been eaten.

The feasibility of doing a clinical study with complete control of morning food consumption is not a realistic expectation in a school situation. The possibility of implementing a similar study in a residential school setting could be explored. Nonetheless, the results still suggest a positive relationship between breakfast nutrition and learning, and we are looking ahead to examining the results of our May testing. In addition, we will continue to explore ways to refine our methodology.

GAIN IN READING SCORES*

	SCHOOL BREAKFAST PROGRAM		NO SCHOOL BREAKFAST
	STARS (Experimental)	HEARTS (Control)	
NUMBER PARTICIPATING	69	64	159
AVERAGE GAIN - EXTENDED SCALE SCORES	11.06	4.73	10.14
AVERAGE GAIN - MONTHS	4.25	1.82	3.90

*Measured by Gates-MacGinitie Reading Tests, Second Edition.

Pretest: Form 1, Week of 9/27/82
Posttest: Form 2, Week of 12/6/82

AMOUNT OF FOOD CONSUMED

Student Identification _____
Week Ending _____

- ☐ ALL
- ☐ 3/4
- ☐ 1/2
- ☐ 1/4
- ☐ NONE

ATTENDANCE AT BREAKFAST

Student Identification _____
Week Ending _____

- (M) Monday
- (T) Tuesday
- (W) Wednesday
- (T) Thursday
- (F) Friday

APPENDIX C

GAIN IN READING SCORES

	SCHOOL BREAKFAST PROGRAM		NO SCHOOL BREAKFAST	
	Experimental Group CLL	Standard Meal Control School	CLL	Control School
Number Participating	62	34	205	129
Average Gain ESS**	17.58	13.12	13.93	14.31
Average Gain in Months	7.03	5.25	5.57	5.73

*Measured by Gates-MacGinitie Reading Tests, Second Edition

Pretest: Form 1, Weeks of 9/12/83 (CLL) and 10/3/83 (CONTROL)

Posttest: Form 2, Weeks of 1/9/84 (CLL) and 1/16/84 (CONTROL)

**ESS - Extended Scale Scores:

Average gain for school year = 25

Months in school year = 10

One month average gain in ESS = 2.5

APPENDIX D

Mean Reading Scores, Standard Deviations, and Difference Score for Breakfast Groups

Experimental Breakfast	Control Breakfast	Difference
M = 17.58	M = 13.12	4.46
SD = 21.02	SD = 19.51	
n = 62	n = 34	

CONTROL

FOOD ITEM	SERVING SIZE	NA MG	KCAL	FAT GS	PROTEIN GS	VIT A IU	VIT C MG	THIAMIN MG	RIBO MG	NIACIN MG	CALC MG	IRON MG
fresh apple	1 med -23/4"diam	1	80	1	T	120	6	.04	.03	.1	10	.4
sweet roll	4 1/4" round		275	15	5	200	T	.18	.19	1.7	33	1.2
milk	8 oz. whole	122	244	8	8	310	2	.09	.40	.2	228	370
TOTAL		123	599	24	13	630	8	.31	.62	2.0	271	371.6

C O N T R O L

FOOD ITEM	SERVING SIZE	NA MG	KCAL	FAT GS	PROTEIN GS	VIT A IU	VIT C MG	THIAMIN MG	RIBO MG	NIACIN MG	CALC MG	IRON MG
apple juice	4 oz. unsweeten.	1	60	T	T	-	1	.01	.02	.1	.7	.75
donut	1-2½" x 1" high		100	5	1	20	T	.05	.05	.4	10	.4
milk	8 oz. whole	122	244	8	8	310	2	.09	.40	.2	228	370
TOTAL		123	404	13	9	330	2	.15	.47	.7	238.7	371.15

C O N T R O L

FOOD ITEM	SERVING SIZE	NA MG	KCAL	FAT GS	PROTEIN GS	VIT A IU	VIT C MG	THIAMIN MG	RIBO MG	NIACIN MG	CALC MG	IRON MG
cranberry jc.	4 oz. unsweeten.	-	8[illegible]	T	T	T	39	.015	.015	.05	.8	.3
cocoa krispies	1 oz.	195	110	0	1	875	15	200	325	3.50	-	-
milk	8 oz. whole	122	244	8	8	310	2	.09	.40	.2	228	370
TOTAL		317	4[illegible]6	8	9	1185	56	200.105	325.415	3.75	228.8	370.3

CONTROL

FOOD ITEM	SERVING SIZE	NA MG	KCAL	FAT GS	PROTEIN GS	VIT A IU	VIT C MG	THIAMIN MG	RIBO MG	NIACIN MG	CALC MG	IRON MG
banana	1 petti	-	100	T	.50	230	6	.03	.04	.4	.5	.4
fruit loops	1 oz.	95	80	0	1	525	9	120	195	2.10	-	-
milk	8 oz. whole	122	244	8	8	310	2	.09	.40	.2	228	370
TOTAL		217	424	8	9.50	1065	17	120.12	195.44	2.70	233	370.4

C O N T R O L

FOOD ITEM	SERVING SIZE	NA MG	KCAL	FAT GS	PROTEIN GS	VIT A IU	VIT C MG	THIAMIN MG	RIBO MG	NIACIN MG	CALC MG	IRON MG
Orange juice	4 oz. unsweetened	-	60	T	1	250	50	.09	.02	.3	14	.50
Frosted flakes	1 oz. sugared	190	110	0	1	875	15	200	325	3.50	--	--
milk	8 oz. whole	122	244	8	8	310	2	.09	.40	.2	228	370
TOTAL		312	414	8	10	143.5	67	200.18	325.42	4.00	242	370.50

FOOD ITEM	SERVING SIZE	NA MG	KCAL	FAT GS	PROTEIN GS	VIT A IU	VIT C MG	THIAMIN MG	RIBO MG	NIACIN MG	CALC MG	IRON MG
Orange juice	4 oz. unsweetened	5	60	T	1	250	50	.09	.02	.3	14	.50
pizza	1/8 of 12" round	702	145	4	6	230	4	.16	.18	1.6	86	1.1
milk	8 oz. whole	122	244	8	8	310	2	.09	.40	.2	228	370
TOTAL		829	449	12	15	790	56	.34	.60	2.10	328	371.60

Excellent - 99%

Students would eat this breakfast every day.

FOOD ITEM	SERVING SIZE	NA MG	KCAL	FAT GS	PROTEIN GS	VIT A IU	VIT C MG	THIAMIN MG	RIBO MG	NIACIN MG	CALC MG	IRON MG
Cranberry juice	4 oz.-33% juice	3	82	T	T	T	39	.01	.015	.05	..8	.3
Mac's & Cheese	1 cup	1086	430	22	17	860	T	.20	.40	1.8	362	1.8
Milk	8 oz. whole	122	244	8	8	310	2	.09	.40	.2	228	370
TOTAL		1211	756	30	25	1170	41	.305	.815	1.5	5908	372.1

72% like 79% like 82% like Some mothers did not like this menu
19% dislike 15% dislike 14% dislike
Slight improvement but not overwhelming, very hard to change eating patterns.

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FOOD ITEM	SERVING SIZE	NA MG	KCAL	FAT GS	PROTEIN GS	VIT A IU	VIT C MG	THIAMIN MG	RIBO MG	NIACIN MG	CALC MG	IRON MG
Apple	1 med 23/4"	1	80	1	T	120	6	.04	.03	.1	10	.4
Cold Chicken	2.8 oz.with bones	-	160	5	26	70	-	.04	.17	11.6	9	1.3
Milk	8 oz. whole	122	244	8	8	310	2	.09	.40	.2	228	370
TOTAL		123	484	14	34	500	8	.17	.60	11.9	247	371.7

60% like
34% dislike
Will try again

FOOD ITEM	SERVING SIZE	NA MG	KCAL	FAT GS	PROTEIN GS	VIT A IU	VIT C MG	THIAMIN MG	RIBO MG	NIACIN MG	CALC MG	IRON MG
Banana	1 small	1	100	T	.50	230	6	.03	.04	.4	5	.4
Hamburger	2.9 oz. 21% fat	66	235	17	20	30	-	.07	.17	4.4	9	2.6
Roll	1 of 8	202	120	2	3	T	T	.16	.10	1.3	30	.8
Milk	8 oz. whole	122	244	8	8	310	2	.09	.40	.2	228	370
TOTAL		391	699	27	31.50	570	8	.35	.71	6.30	272	373.80

90% like
5% dislike
Students wanted ketchup, pickle, some eat only cheeseburgers
*NOTE: 3rd cycle not much change in preference.

EXPERIMENTAL

FOOD ITEM	SERVING SIZE	NA MG	KCAL	FAT GS	PROTEIN GS	VIT A IU	VIT C MG	THIAMIN MG	RIBO MG	NIACIN MG	CALC MG	IRON MG
Apple Juice	4 oz. unsweetened	5	60	T	T	-0-	1	.01	.02	.1	.7	7.5
Pancake	1 4 "	152	55	2	2	60	T	.04	.05	.2	59	.4
Fruit Sauce	1/4c Fruit Cocktail	12	49	T	.25	90	1.25	.01	.01	.25	7.75	.25
Milk	8 oz. whole	122	244	8	8	310	2	.09	.40	.2	228	370
TOTAL		391	408	10	10.25	460	4.25	.15	.48	.75	295.45	371.40

92% like
5% dislike
Did not like fruit sauce

*Note: By 3rd cycle children not opposed to fruit sauce.